visit of the Geologists' Association to Ireland did much to direct attention to the geological features, as well as to the scenic beauties, of the eastern coast; it may be hoped that Mr. Welch's photographic series will form an introduction and an inducement to another visit, this time to the fascinating variety of igneous rocks and Mesozoic strata in the north.

GRENVILLE A. J. COLE.

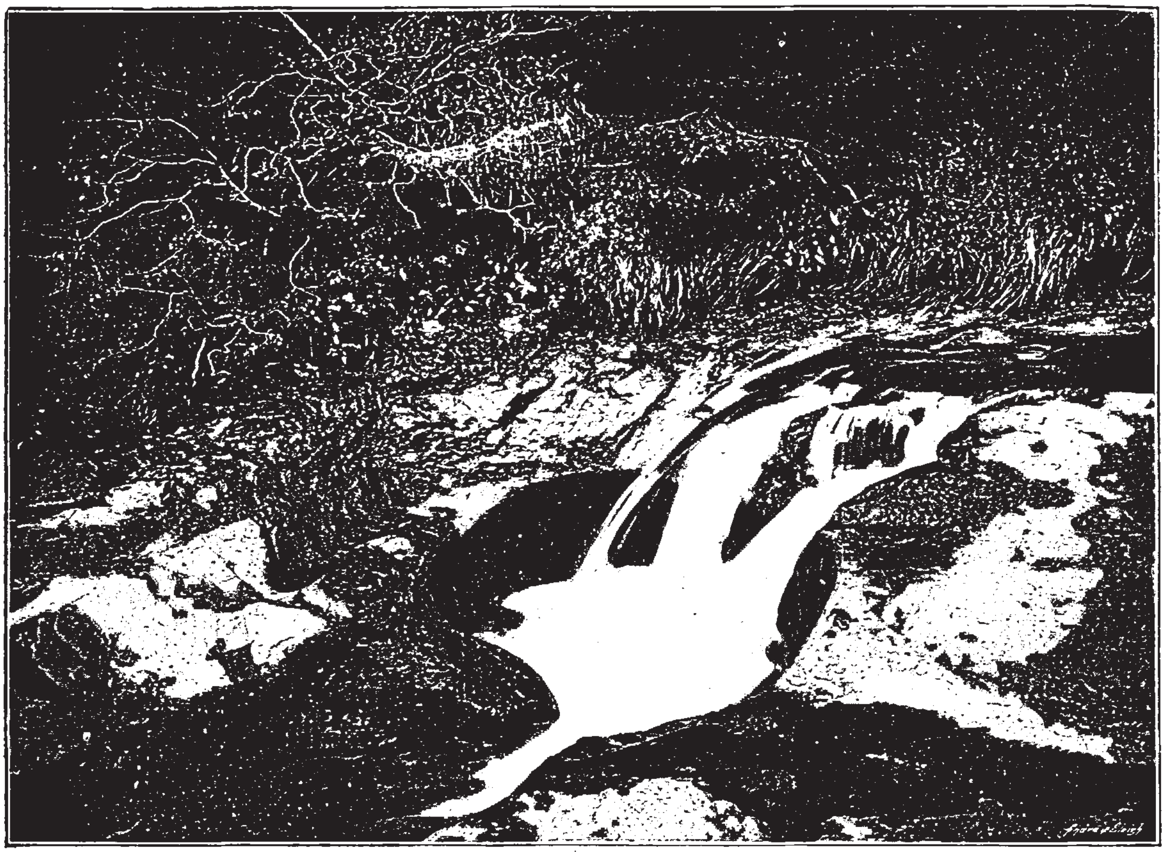

Fig. 2.—Pot-Hole excavated in Triassic Sandstone, Glenariff.

NOTES.

We are pleased to learn that Prof. Prestwich, F.R.S., has been made Foreign Member of the R. Accademia dei Lyncei, Rome, for geology and palæontology.

We regret to hear of the death, from typhoid fever, of Prof. G. H. Williams, of Baltimore. The United States has of late years produced a band of admirable petrographers, amongst whom Prof. Williams has long held a foremost place. His early death will be lamented by a large circle of friends in Europe.

We are sorry to have to record the death, at the age of sixty-six, of the Rev. Edward Hale, who had been for some years the senior science master of Eton College. Mr. Hale died on July 25.

The annual meeting of the Institution of Mechanical Engineers was opened at Manchester on July 31, and is proceeding. Prof. Kennedy is presiding.

The sixty-second annual meeting of the British Medical Association is taking place at Bristol under the presidency of Dr. E. Long Fox, who delivered his presidential address at the evening meeting of Tuesday last.

The British Pharmaceutical Conference began its annual meeting at Oxford on Tuesday, July 31, when Mr. N. H. Martin, of Newcastle-on-Tyne, took the chair, and delivered an address.

The autumn meeting of the Iron and Steel Institute of Great Britain, which this year takes place at Brussels, from August 20 to 24, will probably be very well attended, about 500 members having already intimated their intention of being present. The arrangements for the meeting are being organised by an influential local reception committee, of which M. Gillon, president of the Society of Engineers of Liège, is chairman, in conjunction with the general secretary of the Institute, Mr. Bennett H. Brough. During the meeting, excursions will be made to the Antwerp Exhibition, the Mariemont Collieries, the Couillet Steel Works at Charleroi, the works of the Cockerill Company at Seraing, and the Angleur Steel Works at Liège. The programme of papers to be read and discussed is a long one, there being no less a number than ten arranged for. The first on the list is, "On the Use of Caustic Lime in the Blast Furnace," by Sir Lowthian Bell. Other papers are to be contributed by Messrs. R. A. Hadfield, T. W. Hogg, H. C. Jenkins, W. G. M'Millan, John Parry, and D. Selby-Bigge, respectively, and there are to be two papers of local interest, written by Belgian engineers. Their titles are, "On the Coal-Mining Industry of Belgium," by M. Briart, President of the Society of Engineers of Hainaut; and "On the Iron and Steel Industries of Belgium," by M. A. Gillon, President of the Society of Engineers of Liège.

THE Medical Congress which is to be held in Calcutta from December 24 to 29 next, and to which we briefly referred in our issue of July 5, is, according to present arrangements, to be divided into six sections, viz.. I. Medicine and Pathology. II. Surgery, including Ophthalmology. III. Obstetrics and Diseases of Women and Children. IV. Public Health. V. Medico-legal Medicine and Insanity. VI. Pharmacology. It is hoped that medical men from countries other than India will co-operate to make the Congress a success. Special efforts are being made to secure the comfort of visitors.

THE programme of the one hundred and eleventh meeting of the Yorkshire Naturalists' Union has been issued. The meeting will be held on August 6, at South Cave, for the investigation of the neighbourhood of Drewton Dale, Weedley Springs, and Wold Dale. The sciences of geology, botany, vertebrate zoology, entomology, and conchology will be officially represented by members told off for the purpose; and if the weather be favourable, the meeting will, no doubt, prove as popular as those on former occasions.

THE eighth meeting of the International Ophthalmological Congress will be held at Edinburgh in the second week of this month, under the presidency of Dr. Argyll Robertson. It is thought that about 300 ophthalmic surgeons will be present. The last meeting took place at Heidelberg in 1888.

THE spring of next year will see established at Earl's Court an exhibition, on a large scale, devoted to the products of India.

THUNDERSTORMS occurred over the southern and midland parts of England on Sunday, accompanied by heavy falls of rain, amounting to nearly one inch in several places. Over the southern and south western parts of England, as well as in the south of Ireland, the total rainfall during July has greatly exceeded the average, in many places being double the usual amount, while at Jersey the total was about seven inches, which is nearly three times the average for July, and it is the heaviest fall in that month during the last twenty-nine years. In the east of Scotland and north-east of England the rainfall for the month was rather less than the average.

WE have received from Dr. W. Doberck, a copy of the observations and researches made at the Hong Kong Observatory in the year 1893. The meteorological observations are given for every hour, while the means and various deductions from them have been carefully arranged in tables in a convenient form for future use. The mean temperature during the last ten years was 71°·3, the maximum was 93°·9, and the minimum 32°·0. The average rainfall for a period of thirty years was 90·17 inches; rain mostly falls between May and August. Dr. Doberck gives a useful summary of the climate investigated from ten years' observations. There is a well-marked variation of climate; the winter is cool, its mean temperature being about 60°, while in summer it rises a little above 80°; at this season Europeans suffer much from the excessive dampness of the air. The solar radiation is very considerable in all months; the maximum during 1893 was 154°, in August. Much attention is paid to the study and prediction of typhoons; telegrams giving information about them were issued on eighty-seven days, and with a view to the systematic study of these storms, observations are regularly extracted from ships' logs. During the year no less than 672 logs with entries during typhoons were received, and these were supplemented by observations made at about forty land stations. These various useful researches, in addition to the regular astronomical and magnetical observations, try the powers of the small staff to the utmost, and Dr. Doberck states that the work is much hampered by want of sufficient office accommodation.

THE *Lancet* states that Dr. Bornand, the eminent Swiss consultant lately deceased at Berne, bequeathed his fortune (which was considerable) to the Académie de Lausanne for the endowment of a chair of Embryogeny in that school. His *armamentarium chirurgicum* and his microscopical instruments he also presented to the Académie, while his magnificent library become property of the *bibliothèque cantonale* of his native Canton de Vaud.

WE learn from the *Academy*, that the Pengelly Memorial Fund now amounts to about £1360; and the committee have determined to proceed immediately with the erection of a lecture theatre, as part of the proposed addition to the Natural History Museum at Torquay, of which Mr. Pengelly was the founder.

A CIRCULAR has been sent to us announcing the proposed formation of a society, whose headquarters are to be located at Sydney, to be called "The Palæographical Society of Australasia." The following are among the objects which the society is being established to promote:—"To collect, illustrate, and place on record, examples of all systems of old time written characters, whether in the form of pictograms, symbolism, or phonograms, as also representations of the various mnemonic aids to memory used by so many savage and barbarous peoples. To undertake the collection and formation of a library, to consist of works treating of or connected with Palæography and kindred sciences, as also collections of photographs and other exact copies and illustrations of rock inscriptions, cave paintings, &c. To afford a means of communication and co-operation between those interested in the science of Palæography, who are now unable to obtain this mutual aid. To assist students as far as possible in the work of deciphering new or unknown characters." The Society will, it is announced, be formed as soon as the initial membership reaches a hundred; when, therefore, that number of intending members send in their names, &c., to one or other of the gentlemen named below, a meeting will be called for the purpose of electing officers, passing of rules, &c. The subscription fee is to be one pound per annum. It is intended to establish a periodical as organ of the society, in which will appear original articles on the science of Palæography, with illustrations of various scripts. Further particulars may be obtained from Dr. A. Carroll, Kogarah, Sydney, N.S.W.; or Mr. Elsdon Best, Wellington, New Zealand.

A NUMEROUSLY attended meeting of the Essex Field Club was held last Saturday, in the Navestock district, under the conductorship of the Rev. S. Coode Hore and Prof. R. Meldola, F.R.S. Alighting at Brentwood Station, the party were driven to the site of an ancient entrenchment, which the conductors had identified with the "alate temple of the Druids," described by Dr. Stukeley in the last century. A *fac-simile* of Stukeley's figure, made by Mr. Walter Crouch, was handed round for inspection. Nothing of these ancient remains is now to be seen, excepting a circular depression, and a fosse connected with it, situated in a field bordering the road. From this spot the party proceeded to Navestock Park, the estate of Lord Carlingford, where they were most hospitably entertained at luncheon by Mr. and Mrs. D. P. Sellar, of Dubrook. An ordinary meeting of the Club was held after luncheon, and a discussion took place respecting the proposed cession of certain Essex parishes to Hertfordshire and Cambridgeshire, under the Parish Councils Act. A resolution protesting against this cession was unanimously passed, and a copy ordered to be sent to the Essex County Council and to the Essex Members of Parliament. The members next proceeded to inspect an ancient earthwork in a wood near the park, which earthwork is entered as a camp in the ordnance map. It consists of a well-defined rampart and ditch, and is of an oblong form, with a spur at one angle. The site is now known as "Fortification Wood," but was formerly known as the "Defence of Navestock." The party next proceeded towards the Roding Valley, and were conveyed to Curtismill Green, an outlying fragment of old Hainhault Forest, which, with Epping Forest, formerly constituted the Forest of Waltham. Here they were shown an upright stone, which the conductors had identified as "Richard's Stone," one of the boundary stones set up at the time of the perambulation of the Essex Forest in 1641-1642. Standing by this stone, marking the extreme north-eastern extension of the old forest, Prof. Meldola gave a short account of the history of the perambulation, and stated that with his colleague, Mr. Coode Hore, and Mr. William Cole, the hon. secretary, and his brothers, they had now found five out of the seven boundary stones referred to in the perambulation. The fragment of primitive forest between "Richard's Stone" and the "Navestock Stone" was much admired, as far as time permitted an inspection, and a desire was expressed that steps should be taken for securing the permanent preservation of all these interesting boundary marks, the more especially as the forest of Hainhault has, with the exception of a few isolated patches, been entirely cultivated out of existence. From "Richard's Stone" the party drove through some of the most picturesque parts of the county to South Weald, where, at the "Tower Arms," tea was awaiting them. After tea another meeting was convened for the purpose of hearing a most interesting paper by Mr. Coode Hore, in which he gave a series of notes on the history of Navestock in Saxon and Norman times, and made reference to the prehistoric remains visited in the course of the day.

THE annual report of the Director of the Royal Botanic Garden, Calcutta, for the year 1893-94, has just reached us. During the year the Herbarium was enriched by more than 16,000 specimens, and the Garden in return sent out numerous specimens to various botanical institutions in different parts of the world. Reference is made to a great storm which raged for nearly the whole of three days in the month of May, and the damage done was so great that for about six weeks after its occurrence the whole of the out-door labour staff was engaged in making repairs. A more suitable platform for Colonel Kyd's monument was erected, the roads in the grounds were generally improved, and the gardens are reported to have been maintained in a high state of efficiency.

M. L. CAYEUX (*Bull. Soc. Geol. France*) describes radiolarians from rocks in Brittany which are generally admitted to be pre-Cambrian. They occur in siliceous bands in the "Phyllades de Saint-Lô." The evidence for the pre-Cambrian age of these beds is stated by Dr. Barrois. Many of the radiolarians described belong to the genera still existing.

A PAPER on the "Shasta-Chico Series," of N. California and Oregon (*Bull. Geol. Soc. Amer.*), by Messrs. J. S. Diller and T. W. Stanton, is interesting as discussing the limits of the Cretaceous and Jurassic formations on the Pacific Coast. The series has a maximum thickness, on Elder Creek, Tehama Co., California, of 30,000 feet; the whole set of beds graduating into one another as one continuous series. It was formerly supposed that the lower (Knoxville) beds graduate into the Mariposa beds—the highest Jurassic; the authors contend that there is both a physical and palæontological break between them. The highest Cretaceous rocks are not here represented, and the Téjon beds, which probably are not the oldest Eocene, rest unconformably upon the Chico series. In Middle and Southern California the Téjon beds are believed to be conformable to the Chico beds.

PROF. H. F. OSBORN discusses the characters and faunal relations of the Laramie Mammals (*Bull. Amer. Mus. Nat. Hist.* vol. v., p. 311), and shows that they are more nearly related to the Puerco (Eocene) mammals than they are to those of the Jurassic series. This is specially illustrated by the evolution of the teeth. In the same volume, there are papers by Prof. Osborn, Dr. J. L. Wortman, and Ch. Earle, on the Lower Miocene mammalia of North America. The White River deposits have a maximum thickness of about 800 feet, and they represent a great period of time, during which the Titanotheriidæ, Rhinocerotidæ, Equidæ, and Oreodontidæ underwent considerable modification, amounting in some cases to changes of true generic significance.

A NEW design for large spectroscopic slits is described by Mr. Wadsworth in the current number of the *American Journal of Science*. Of the various forms of double motion spectroscope slits which have been designed, the two forms in most common use are the parallel ruler form, as fitted to most German instruments, and that form in which the jaws slide in guides, and are moved simultaneously in opposite directions by a right and left hand screw. The first form is convenient but somewhat bulky, and makes it difficult to determine the exact width of the slit. The second form, in which the screw is necessarily at one side of the jaw, gives rise to a twisting strain tending to make the slit wider at one end than at the other, an objection which becomes very serious in slits above 5 cm. in length. The author's new form, designed for Prof. Langley, has the advantage of giving a central thrust on both jaws while keeping the slit accurately centred. This is accomplished by making the milled head move the whole jaw system along the slit plate by means of a nut screwed to the latter, while another screw on the same shaft, but of double the pitch, moves the nearer jaw independently in the opposite direction. Thus the centre of the slit remains fixed, the jaws opening out from it. A spring provides for the return motion, and takes up all back lash in the screw. The graduated head gives by its motion over a graduated drum the whole number of turns and fractions of a turn, enabling the width of the slit to be determined at a glance. The thrust being central, there is no tendency to twist the jaws in their guides. The slit has a clear opening of 10 cm.

IT appears that the public in Brooklyn, U.S.A., are making use of the stray current from the electrical tramways, driving motors and lighting lamps, by connecting the terminals to the metallic framework of the overhead railways and to the water-pipes; while it is proposed in one of the suburban telephone exchanges to utilise the above current, and do away with the batteries. The loss of energy on the American lines where the current is supplied by a trolley wire, and the return takes place by the rail, is very considerable, and the above use of the stray current is much more likely to draw the attention of the tramway companies to these losses than the corrosion of the water- and gas-pipes, the damage to which we have on previous occasions referred.

ACCORDING to the *Pioneer Mail*, Allahabad, the anthropometrical system of identification has already proved of practical use in Bengal. Previous convictions against six men, who had been sentenced in districts beyond Calcutta, were traced by its means.

Engineering for July 27 is a special number, and is, for the most part, taken up with a description (with illustrations) of the various mills and appliances used in the manufacture of cotton at or near Manchester, in which city the Institution of Mechanical Engineers is at present holding its summer meeting. This section of the number is, in fact, specially designed for the use of those who are taking part in the meeting of the Institution.

PART 2 of vol. xv. of the *Journal* of the Sanitary Institute contains, besides Proceedings of the Institute, notes on sanitation abroad, &c., an article by Dr. Louis Parkes, entitled "The Possibility of the Spread of Disease through the River Waters supplied to London," being a review of the evidence given by the bacteriological witnesses before the Royal Commission on Metropolitan Water Supply, 1893.

THE August number of *Natural Science* contains the following articles:—"The Evolution of the Thames," Dr. J. W. Gregory; "Some Account of the Gall-making Insects of Australia," W. W. Froggatt; "Books of Reference in the Natural Sciences," C. Davies Sherborn; "Some Reforms in the Oxford University Museum," E. S. Goodrich; "Hertwig's 'Preformation or New Formation,'" P. Chalmers Mitchell; and a special illustrated supplement on "Taxidermy as a Fine Art." The process illustrations in this supplement, and in the article by Mr. Goodrich, are for the most part very successful.

THE "Proceedings of the Physical Society of London," vol. xii. part 4, has just been issued.

THE August part of *Science Gossip* has a portrait of Dr. Ludwig Mond, F.R.S., the munificent donor of the new laboratory for physical and chemical research in connection with the Royal Institution to which we referred at length in our issue of July 5.

ANOTHER remarkable nitrogen compound, nitramide NO_2NH_2, is described in the current *Berichte* by its discoverers, Drs. Thiele and Lachman, of Munich. A short time ago, these chemists showed that by the action of sulphuric and nitric acids upon urethane a nitro-derivative, nitrourethane $NO_2 . NHCOOC_2H_5$, was produced. When this substance is dissolved in water, and the concentrated solution is mixed with a large excess of a concentrated solution of caustic potash in methyl alcohol, and the mixture cooled by ice, a potassium salt of the composition $NO_2 . NK . COOK$ is deposited in crystal plates. If these crystals are placed in water they instantly decompose with great rise of temperature into potassium carbonate and nitrous oxide. If, however, they are placed in a mixture of ice and sulphuric acid, carbon dioxide is evolved, and the new substance nitramide is produced. It may be extracted by means of ether, and upon evaporation of the latter it is left behind in the form of clear colourless prisms. The crystals melt at 72°, but the least trace of moisture lowers the melting point very considerably. Nitramide is readily soluble in water, ether, and alcohol, but difficultly soluble in benzene. The aqueous solution reacts strongly acid. Nitramide is volatile, considerably so even at the ordinary temperature. It is an unstable substance, and decomposes on mixing with copper oxide or lead chromate, or even on admixture with powdered glass, great rise of temperature occurring in each case. The products of decomposition are nitrous oxide and water. When heated rapidly above its melting point it explodes. Nitramide is instantly decomposed by alkalies, not only by caustic alkalies but also by carbonates, ammonia, borax, and even sodium acetate, in the cold, with evolution of nitrous oxide. It would thus appear to be incapable of forming salts, at any rate in solution. The crystals explode violently, with production of flame, when a drop of caustic soda or potash is allowed to fall upon them. The ethereal solution of the crystals yields with ammonia a precipitate of an ammonium salt, but it decomposes almost immediately with evolution of gas. Concentrated sulphuric acid or hot water similarly provoke violent decomposition. Upon reduction a substance endowed with powerful reducing properties is produced, which would appear to be hydrazine

$\begin{array}{c} NH_2 \\ | \\ NH_2 \end{array}$

The discoverers of this interesting substance are continuing the study of its reactions, and are attempting to prepare it in a purely inorganic manner.

THE additions to the Zoological Society's Gardens during the past week include a Vervet Monkey (*Cercopithecus lalandii*), a Hygian Snake (*Elaps hygiæ*) from South Africa, presented by Mr. J. E. Matcham; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. J. A. Brand; a Common Paradoxure (*Paradoxurus typus*) from India, presented by Mr. E. Stallard; a Suricate (*Suricata tetradactyla*) from South Africa, presented by Miss Champneys; an Indian Cobra (*Naia tripudians*) from India, presented by Mr. Angus M. Kinloch; two Slowworms (*Anguis fragilis*), British, presented by Mr. T. E. Gunn; two —— Opossums (*Didelphys*, sp. inc.) from South America, a Common Cassowary (*Casuarius galeatus*) from Ceram, a Hawk-headed Parrot (*Deroptyus accipitrinus*) from Brazil, two Hamadryads (*Ophiophagus elaps*) from India, deposited; a Pleasant Antelope (*Tragelaphus gratus*), bred in Germany, purchased; a Thar (*Capra jemlaica*), a Red Deer (*Cervus elaphus*), three Cairo Spiny Mice (*Acomys cahirinus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SPECTROSCOPIC VELOCITIES OF BINARIES.—The determination of the elements of double-star orbits from spectroscopic measurements has been attempted by two methods. That due to Dr. Wilsing, which is a very convenient one, is only applicable to cases of small eccentricities; another method, developed by Dr. Rambaut, is not subject to this limitation, but is rather elaborate. In No. 3242 of the *Astronomische Nachrichten*, Prof. R. Lehmann-Filhés works out a method somewhat akin to that of Dr. Rambaut, but which he claims to have discovered independently, and which does not require difficult calculations or constructions. If both components of a spectroscopic double are bright enough to give a measurable spectrum, as is the case with β Aurigæ and ζ Ursæ Majoris, the velocities as determined from the displacement of the lines in the spectrum are taken as relative, and the investigation then deals with the motion of one mass with respect to the other considered as stationary. If, on the contrary, only one of the components gives a measurable spectrum, as in the case of Algol and α Virginis, the motion must be referred to the centre of gravity of the system, the radial velocity of which must be determined and subtracted from the observed velocities. The period of the star is easily determined by observing a considerable number of periodic variations, and all observations can then be reduced to a single revolution by adding or subtracting multiples of the period. These spectroscopic velocities are then plotted as ordinates with the times as abscissæ, and a wavy curve is thus obtained showing the maximum and minimum velocities relative to the solar system. If these velocities are referred to the centre of gravity of the system, the areas of the curve above the axis of abscissæ must be equal to those below, *i.e.* the total displacements must neutralise each other. This gives a condition which the curve must fulfil, and which serves to control the observed velocities. Another condition is that the area intercepted between the maximum positive ordinate and the next point of intersection with the axis of abcissæ must be equal to the area of the curve between that point and the maximum negative ordinate, this representing the motion of the star from the ascending to the descending node. Prof. Lehmann-Filhés gives simple formulæ for determining the various elements of the orbit from the corrected curve. Comparing his method with that of Dr. Rambaut for the case of β Aurigæ, he finds 0·158 for the eccentricity, where the latter found 0·156, and 57°·93 for the longitude of the ascending node, against Dr. Rambaut's 57°·43, showing differences which are well within the errors of observation. The real daily motion is found to be 90°·726, corresponding to a period of 3·968 days. The apparent semi-major axis of the orbit comes out as 7,516,000 English miles, which agrees very closely with the value obtained by Dr. Rambaut, viz. 7,500,000.